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L Band Scintillation and VHF Coherent Radar Observations at São Luis, Brazil

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Abstract:

During November 10th to 20th, INPE carried out simultaneous L Band scintillation and coherent VHF radar observations at São Luís (2.33 S, 44.00 W, dip latitude 1.3 S), a Brazilian equatorial station. In this presentation we will focus on the comparison between the data obtained at São Luís using radar and scintillation techniques. For scintillation observation we have used Global Positioning System (GPS) based scintillation monitors developed by Cornell University. These scintillation monitors measure amplitude scintillation of the L1 (1.575 GHz) signal transmitted by GPS satellites. These transionospheric signals are sensitive to ~400 meters electron density irregularities, considering these irregularities to be situated around 350 km of altitude. Observations were also made by VHF (30 MHz) coherent radar, recently developed and installed at São Luís. This radar gives Range-Time-Intensity (RTI) maps of the echoes from 5 meters irregularities at zenith, as well as the zonal and vertical velocities of these irregularities. During the period we observed plumes on all nights except November 19, on which scintillation was also absent. Comparing the radar maps and scintillation data from GPS satellites with elevation higher than 50 degrees we have observed strongest scintillation (S4 ~0.3) only during the fully developed plumes, with strong radar echoes. During the remaining part of the time, S4 was ~0.2 or less. During November 13, there was a precursor bottom-type layer that started to rise from about 400 km at 18:45 LT to 500 km around 20:00 LT followed by plume like structure. During the bottom-type layer occurrence, scintillation index was lower than 0.1 while during the plume S4 exceeded 0.2. In this presentation we will report these 10 days' observations and we will discuss their physical implications.